— mine file
J. whitehead

PRO/037/032

KELMINE CORP.
4901 YORK STREET • P.O. BOX 16043 • DENVER, COLORADO 80216 • PHONE 303/534-4102

November 21, 1985

United States Department of the Interior
Bureau of Land Management
Moab District
Grand Resource Area
P.O. Box M
Moab, Utah 84532

Attention: Mr. Colin Christensen, Area Manager

Re: 3809 (U-068) U68-P85-01
Letter of October 24, 1985

Dear Mr. Christensen:

I will respond to your questions as presented.

1) The State Bureau of Water Pollution Control has not responded to our application as of this date.

2) The local Health Department Construction Permit is enclosed.

3) A copy of Hazen Research, Inc. letter covering this topic is enclosed.

4) The EPA Toxicity Tests concentrations of the leached tails are enclosed as well as located on page 46 of the application.

5) This topic was inadvertently omitted from the original application.

The enclosed calculations show the following areas that will require reclamation.

Phase I Tails	5.33 Acres
Phase II Leach Tails	18.60 Acres
Pretreatment Site	1.7 Acres
Process Ponds	2.5 Acres
Plant Site	6.5 Acres
Haul Road	5.0 Acres
TOTAL	39.63 Acres

The required reclaim material to cover this area one foot deep is:

$$39.63 \text{ Ac.} \times 43.560 \text{ ft.}^2/\text{Ac.} \times 1 \text{ ft. deep} \div 27 \text{ ft.}^3/\text{yd.}^3 = 63{,}936 \text{ yd.}^3$$

During construction of the leach pads, tailing disposal site and adjacent areas (35 acres) approximately 55,000 $yd.^3$ of topsoil can be reclaimed and stockpiled. Since each of the tailings piles will be reclaimed approximately one year after each pile is finished leaching, the reclaim pile will not total 55,000 $yd.^3$. Only two of these piles requiring approximately 15,000 $yd.^3$ each will be in use at one time. Thus the reclaim pile will total only 30,000 $yd.^3$ at any given time. The remaining 9,000 $yd.^3$ required for total reclamation will be taken from the existing 125,000 $yd.^3$ reclaim stockpile located just northwest of the process ponds. (See Map B, Pocket A).

I trust that the enclosed will answer your concerns.

Sincerely,

Melvin R. Swanson
Manager

MRS/n
Encls.

cc: Utah Division of Oil, Gas & Mining
Utah Division of Water Pollution Control

SOUTHEASTERN UTAH DISTRICT HEALTH DEPARTMENT
APPLICATION FOR SEPTIC TANK

RECEIVED
NOV 27 1985
DIVISION OF
OIL, GAS & MINING

Name of Owner Kelmine Corp.

Present Address P. O. Box 1383, Moab, Utah 84532 Telephone 259-6711

Name of Contractor License No.

ADDRESS OF INSTALLATION Lisbon Valley Copper Location , San Juan, Utah

APPLICATIONS WILL BE REJECTED UNLESS ACCOMPANIED BY THE FOLLOWING:

*1. Completed percolation test certificate with a minimum of 2 test holes, soil exploration, and water table results.
2. $25.00 permit fee (cash, check, or money order).

Is this to be installed on a federal loan? (FHA, VA, FARMER'S HOME) Yes_____ No XXX
Water supply: Public _____ Private XXXX

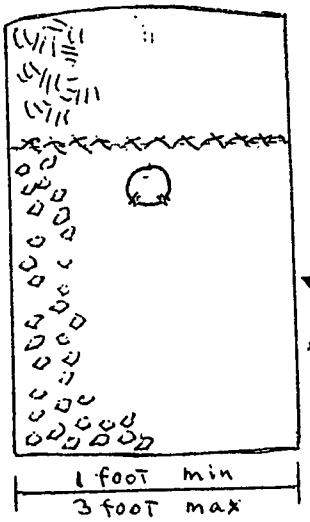
SIZING INFORMATION

1. Maximum number of bedrooms in home _____, will there be a plumbed basement?
   20 employees @ 35 Gallons per day per person
2. Size of Septic Tank 1000 gals. (Minimum 1,000 gals, for 3 bedrooms or less, and add 250 gallons for each additional bedroom).
3. Amount of absorption area required per bedroom is determined by percolation test, or by character of soil as typed by unified soil classification system.
4. Total amount of trench area needed per bedroom _____ sq. ft. ____#bedrooms, times _____ minimum sq. ft. per bedroom, = 1555 sq. ft. Soil Type Cl 10-28-85 W. J. Adamson
5. Total amount of trench area to be installed 1640 sq. ft.
6. The minimum number of lateral trenches is two, maximum length of 100 feet, with a maximum slope of the pipe being 4 inches in 100 feet. (level preferred)

TRENCH CROSS-SECTION

Barrier of:
Straw_____
Paper_____

Gravel must be clean!!
Sized:
Shallow Trench
3/4" to 2½"
Deep Trench
3/4" to 12"
Trench width
2 ft.



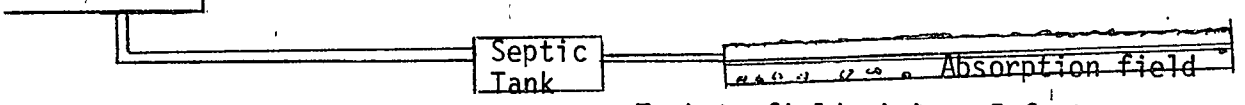
Amount of back-fill over barrier 1½+ ft.
Minimum 1 ft.

Amount of gravel over pipe
2 in.

Amount of gravel under pipe
5 ft. _____
Minimum 6 inches or 12 inch if within 10 feet of trees

Minimum 2 feet for deep trench systems.

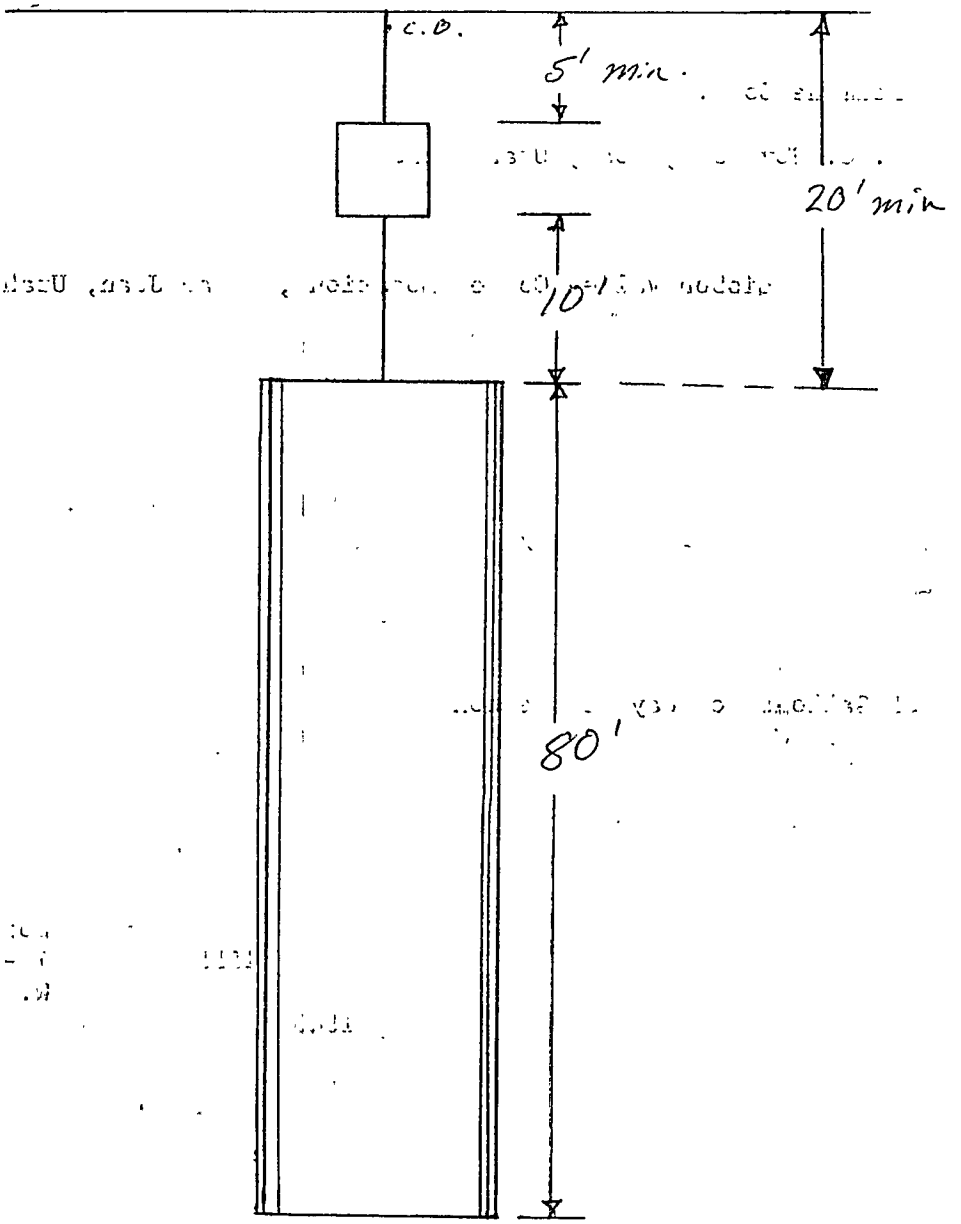
Indicate Slope of Ground



Wall to tank minimum 5 feet.

Tank to field minimum 5 feet.

OVER: DRAW PLAN ON BACK LARGE SCALE AND SIGN NAME.



Plan APPROVED Only
NOT FINAL APPROVAL
A FINAL ON SITE INSPECTION IS REQU
BEFORE SYSTEM IS COVERED
DATE 11-1-85 BY

Oct. 28, 1985

Melvin R. Swanson

Hazen Research, Inc.
4601 Indiana St. • Golden, Colo. 80403
Tel: (303) 279-4501 • Telex 45-860

November 12, 1985

Mr. Mel Swanson
Kelmine Corporation
P.O. Box 1383
Moab, Utah 84532

Re: HRI Project 6084
Soil Tests-Lisbon Valley Copper Project

Dear Mr. Swanson:

In accordance with your recent request, I am enclosing a copy of the procedure used by Hazen for determining the amount of sulfuric acid that is consumed by a material.

Also, you asked how Hazen calculated the volume of soil that would be required to neutralize 73,000 gallons of acid solution in case a spill occurred during leaching of an ore heap. The 73,000 gallons is, based on pilot plant test data, the estimated amount of solution that could drain from the heap in case of a pump failure or a break in the pipe which transports solution from the heap to the pregnant liquor pond.

The calculation of soil volume is as follows:

A. Solution acidity-2.1 pH containing 0.4 grams per liter of free sulfuric acid.

B. Solution volume-73,000 gals = 276,305 liters.

C. Pounds of free sulfuric acid in 73,000 gals = 276,305 liters x 0.4 grams per liter of free sulfuric acid divided by 453.6 grams per lb = 243.6 lb free sulfuric acid.

D. Acid consumption of soil in heap leach area = 130 lb sulfuric acid per ton of soil (see letter from R. B. Coleman of Hazen to Mel Swanson of Kelmine dated September 19, 1985, "Soil Tests" section. See page 45 of original application

E. Tons of soil to neutralize the 243.6 lb of free sulfuric in 73,000 gals = 243.6 divided by 130 = 1.87 tons. Assuming density of soil in place is 80 lb per cubic ft, then 46.75 cubic ft of soil would be required for acid neutralization.

F. Assume that the solution would penetrate 1/2-inch into the soil, then a 1122 ft^2 area would be required for neutralization (1122 ft^2 x 1/2-inch divided by 12-inches per foot = 46.75 cubic ft).

The reaction between the soil and the free sulfuric acid is very rapid. After the free acid is destroyed, the pH of the solution will be above 4.5 and the copper and the iron in solution will be precipitated as insoluble compounds. The precipitation of copper and iron was demonstrated in the lab by contacting pregnant liquor solution from the pilot leach plant with soil samples from the proposed leach area.

If 1122 ft^2 of area is contaminated 1/2-inch deep, this area could be easily cleaned up with a front-end loader and the material piled on an ore heap.

The soil permeability tests were run in accordance with ASTM Procedure No. D2434-68 (revised 1974).

With regard to your question concerning a break in the pipe transporting solution from the ore heaps to the pregnant liquor pond, I have the following comments:

1. The pipe will be schedule 40 or equivalent CPVC or polyethylene pipe, both of which are acid resistant and are used extensively for solution transport in all weather conditions. Since your transport pipe will not be under pressure, the likelihood of a break in the pipe is remote.
2. A flow sensor could be installed at the discharge end of the pipe which would sound an alarm if the solution flow stopped. However, such alarm systems have been tried in the transport pipes for gold cyanide solutions from heap leach operations and have not proved totally dependable. Verbal communication with heap leach operators indicates that a good quality and well installed and maintained pipe system is the best method of preventing a solution spill.

If you have any questions regarding the soil tests and enclosed information, please let me know.

Very truly yours,
HAZEN RESEARCH, INC.

R. B. Coleman
Vice President

RBC:dr
Enclosures

HAZEN RESEARCH, INC.
ANALYTICAL PROCEDURE
June 1973

Determination of the Acid Consumer Fraction of Minerals Ores and Mill Products

OUTLINE

The procedure gives an empirically derived value of the quantity of acid consumed by a sample under conditions of the test. The sample is contacted with a standardized sulfuric acid solution under fixed conditions. The remaining unconsumed acid is titrated with a standardized sodium hydroxide solution to a pH of 7.2. The addition of a complexing agent prevents the formation of many of the hydroxide precipitates.

RANGE

A value is calculated from 1 to 175 lbs sulfuric acid consumed per ton of sample material.

PRECISION AND ACCURACY

Summarized in the table below:

Standard Taken	Present Acid Consumed Value (lb/t)	Number of Determinations	Acid Consumed Value Found (lb/t)	% Standard Deviation	% Error

Because this is an empirical test, variations from the written procedure may cause a lack of precision. Therefore, there must be strict adherence to the fixed conditions of the test.

INTERFERENCES

Interferences in the usual sense do not exist.

APPARATUS

pH meter, Weeds and Northrup, Model 7410, or equivalent, with a glass/calomel electrode assembly.

Magnetic stirrer and stirring bar.

Titrating Buret, class A, 50 ml, with Teflon® stopcock.

REAGENTS

Sodium Hydroxide Solution, ≈0.2N.

Dissolve 8.0 g AR sodium hydroxide pellets in 200 ml distilled water. Transfer to a 1000 ml volumetric flask and dilute to the mark with distilled water. Standardize according to instructions in the Standardization Section. Store in a polyethylene bottle.

Sulfuric Acid Solution, ≈0.5N.

Transfer 14.0 ml concentrated sulfuric acid (Sp.Gr. 1.84) to a 1000 ml volumetric flask containing 500 ml distilled water. Dilute to the mark with distilled water. Standardize according to instructions in the Standardization Section.

Potassium Oxalate, monohydrate, AR cyrstals.

PROCEDURE

The superscripted numbers throughout the procedure refer to the subsequent notes. These notes should be consulted before any analysis is attempted.

Transfer 7.5 g[1] (weighed to the nearest milligram) of the sample to a 250 ml beaker. Add 50 ml distilled water and swirl. Pipet 25 ml standardized sulfuric acid solution into the flask and swirl.[2]

Place beaker in a water bath at 25°C and allow to digest for 1 hour, swirling every 7 minutes during the hour. Two minutes prior to the termination of the hour, remove from the water bath, add 15 g potassium oxalate[3], a magnetic stirring bar and stir at a medium speed for 2 minutes on a magnetic stirrer.

Rinse sides of beaker with ≈10 ml distilled water and immediately titrate the unconsumed sulfuric acid with standardized sodium hydroxide solution to a pH meter reading of 7.2.[4]

NOTES ON PROCEDURE

1/ If, after using a 7.5 g sample weight, the assay is greater than 100 lb sulfuric acid per ton of sample, the sample is to be rerun using a 4.0 g (weighed to the nearest milligram) sample weight.

2/ To provide the same conditions for each sample, the addition of the standardized sulfuric acid is to be set up on a seven-minute interval when more than one sample is involved. Thus, upon addition of the acid to the first sample, a time interval of seven minutes is allowed to pass before the addition of the acid to the second sample, and for each of the remaining samples.

The seven-minute interval will provide adequate time for the subsequent titration of the sample and not jeopardize the timed conditions for the remaining samples. Nine samples can be assayed in this manner with consistent control of time and reagents.

3/ Many of the major elements which form insoluble hydroxides during the sodium hydroxide addition, are complexed with the potassium oxalate addition.

4/ Upon reaching a pH of 7.2, a deflection of the meter to a lower pH may be observed, but the end point is to be considered final when the meter first indicates a pH of 7.2.

STANDARDIZATION

Sodium Hydroxide Solution

Transfer 1 g potassium acid phthalate (weighed to 0.1 milligram and previously dried for one hour at 110°C) to a 250 ml erlenmeyer flask. Add 100 ml distilled water and warm slightly until salts have dissolved completely. Add 3 drops 0.1% w/v phenolphthalein indicator solution and titrate with the sodium hydroxide solution to a faint permanent pink color. Titrate three separate potassium acid phthalate weighings and average the normalities determined for each.

$$N\ NaOH = \frac{\frac{Wt\ KHC_8H_4O_4}{204.2} \times 1000}{ml\ NaOH}$$

Sulfuric Acid Solution

Pipet a 50 ml aliquot of the standardized sodium hydroxide solution into a 250 ml erlenmeyer flask. Adjust the volume to 100 ml with distilled water. Add 3 drops of 0.1% w/v phenolphthalein indicator solution and titrate with the sulfuric acid solution just to the disappearance of the pink color. Titrate three separate standardized sodium hydroxide aliquots and average the normalities determined for each.

$$N\ H_2SO_4 = \frac{(N\ NaOH)\ (ml\ NaOH)}{ml\ H_2SO_4}$$

CALCULATION

Pounds H_2SO_4/ton of sample is calculated as follows:

$$\text{lbs } H_2SO_4/\text{ton of sample} = \frac{[(ml\ H_2SO_4)\ (N\ H_2SO_4) - (ml\ NaOH)\ (N\ NaOH)] \times 98}{\text{Sample wt in grams}}$$

transported and blended with the higher permeability soil under the solution storage ponds so that the finished compacted soil under the solution ponds has a permeability of less than 10^{-6}.

Reclamation

EPA toxicity tests were performed on leached tails from both copper oxide and sulfide ores. The results are as follows:

	Analysis (ppm)	
Element	Oxide Ore	Sulfide Ore
As	<0.001	0.002
Ba	0.85	0.91
Cd	0.003	0.004
Cr	<0.01	<0.01
Pb	0.22	0.35
Hg	<0.0001	<0.0001
Se	<0.001	0.001
Ag	<0.01	<0.01

With regard to fertilization of the ore for reclamation, approximately 20 lb of ammonium sulfate per ton of leached tails will be available, as required from the precipitation of finished product, for fertilizing tailings for reclamation. The ammonium sulfate will be available as a solution, which can be adjusted to the desired concentration of ammonium sulfate.

Flowsheet and Material Balance

A process flowsheet with material balances for treating 175,000 tons of ore per year is shown in Figure 6.

Reclaim Area Calculations for Tailings Piles

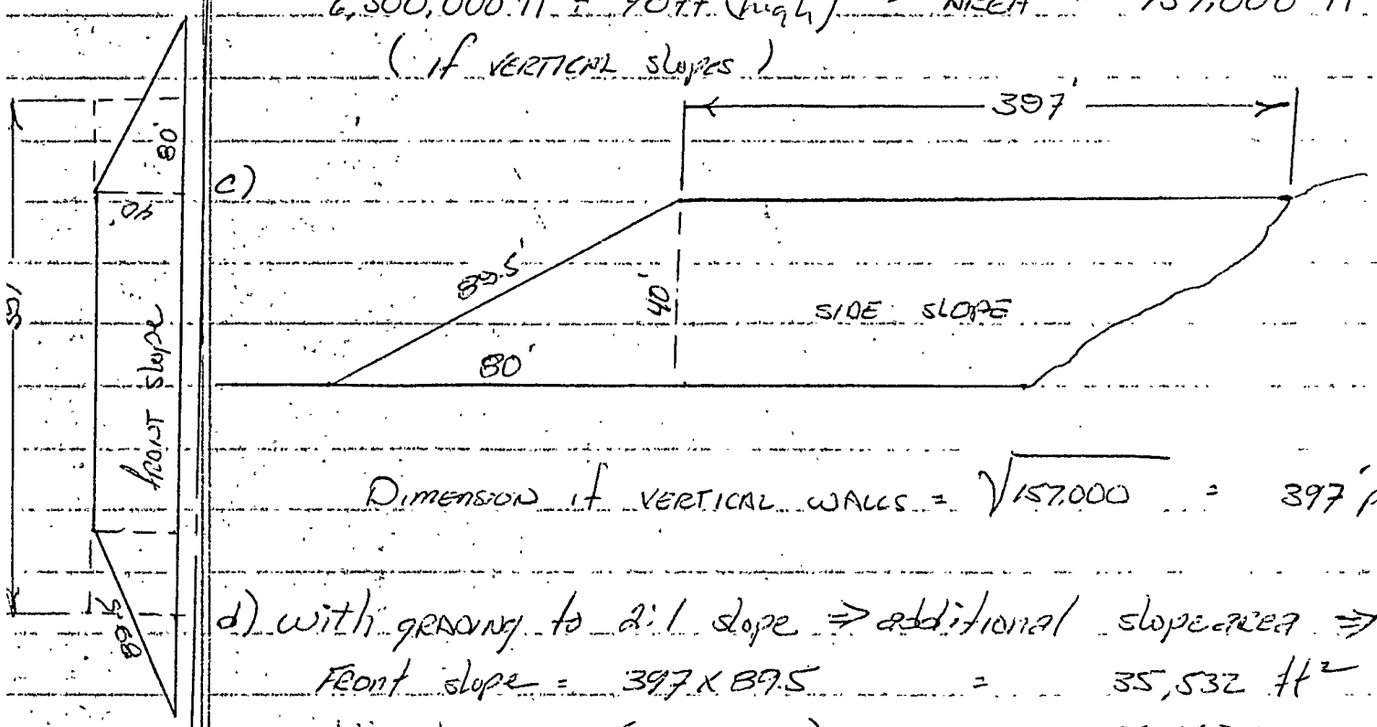
Phase I tails:

a) 350,000 tons @ 2:1 slope 40 feet high blended into existing hillside

b) 350,000 tons × 18 ft³ (compacted) / ton = Vol = 6,300,000 ft³

6,300,000 ft³ ÷ 40 ft (high) = Area = 157,000 ft²

(if vertical slopes)



Dimension if vertical walls = $\sqrt{157{,}000}$ = 397' per side

d) with grading to 2:1 slope ⇒ additional slope area ⇒

Front slope = 397 × 80.5	=	35,532 ft²
side slopes = 2(397 × 80.5)	=	71,063
Top = 397(397 − 2×40)	=	125,849

Total Reclaim Area 232,444 ft²

5.33 acres

e) covered one (1) foot deep =

232,444 ft² × 1 ft ÷ 27 ft³/yd³ = 8609 yd³

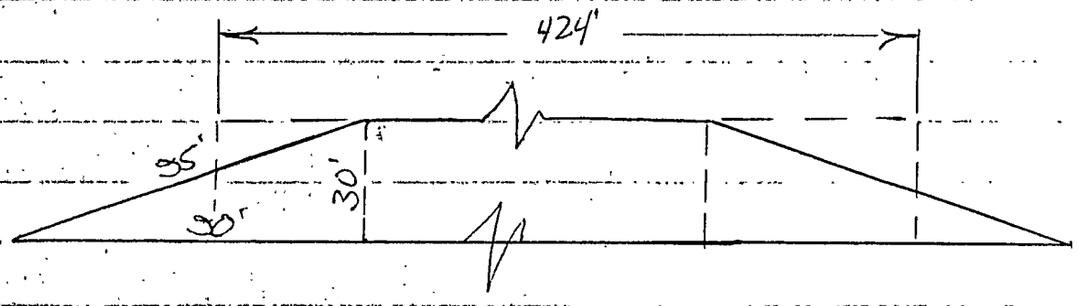
PHASE II tons:

a) 3 piles at 300,000 tons each REGRADED to 3:1 slope @ 30 feet high

b) $300{,}000 \text{ tons} \times \frac{18 \text{ ft}^3}{\text{ton}} = \text{VOL} = 5{,}400{,}000 \text{ ft}^3$

$5{,}400{,}000 \text{ ft}^3 \div 30' \text{ high} = \text{AREA} = 180{,}000 \text{ ft}^2$
(if VERTICAL slopes)

c)



Dimension if VERTICAL slopes = $\sqrt{180{,}000 \text{ ft}^2} = 424 \text{ ft}$ per side

d) WITH REGRADING to 3:1 slope ⇒ Additional slope AREA ⇒

slopes: $4(424 \times 95) = 161{,}120 \text{ ft}^2$

top: $[424 - 2(47.5)][424 - 2(47.5)] = 108{,}241$

Total Reclaim AREA per pile = $269{,}361 \text{ ft}^2$

6.20 ACRES

3 piles = 18.60 ACRES

e) Reclaim MATERIAL Vol. covered (1) one foot deep:

$269{,}361 \text{ ft}^2 \times 1 \text{ ft} \div 27 \frac{\text{ft}^3}{\text{yd}^3} = 9{,}976 \text{ yd}^3$ / pile

3 piles $\times$ 9,976 $= 29{,}928 \text{ yd}^3$

PLANT SITE AND PONDS:

a) PRETREATMENT FACILITY = 1.7 ACRES
PROCESS PONDS = 2.5
PLANT SITE = 1.0
HAUL ROADS = 5.0
TOTAL AREA TO BE RECLAIMED = 10.2 ACRES

b) Volume of Required Mat'l.

$10.2 \text{ AC} \times \frac{43,560 \text{ ft}^2}{\text{AC}} = 444,312 \text{ ft}^2$

COVERED (1) ONE FOOT DEEP = 444,312 ft³

$444,312 \text{ ft}^3 \div \frac{27 \text{ ft}^3}{\text{yd}^3} = 16,456 \text{ yd}^3$

Total Reclaim Material for one (1) foot deep coverage:

PHASE I TAILS = 8,609 yd³
PHASE II TAILS = 29,928
PLANT SITE ETC. = 16,456

TOTAL VOL = 54,993 yd³